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DOMINION OF CANADA

DEPARTMENT OF THE INTERIOR

Hon. Thomas G. Murphy, Minister — H. H. Rowatt, Deputy Minister
F. H. Peters, Surveyor General and Director, Topographical Survey

ANNUAL REPORT

OF THE

TOPOGRAPHICAL SURVEY

FOR THE

FISCAL YEAR ENDED MARCH 31, 1931

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CONTENTS

	Page
General Statement	3
Résumé of Operations for the Year	5
Aerial Surveys	5
Topographical and Photo-topographical Surveys	7
Control and Exploration Surveys	7
Legal Surveys	7
Interprovincial Boundary Surveys	8
Land Classification Surveys	9
Magnetic Declination Surveys	9
Physical Testing Laboratory	10
Registration, Records and Distribution	10
Map Publication	10
Geographic Board of Canada	11
Board of Examiners for Dominion Land Surveyors	11

APPENDICES

1. Schedule of surveyors employed, and work executed by them 1930-1931 13
2. List of map sheets of the National Topographic series and the Sectional Map series issued 1930-1931, and in hand March 31, 1931 17
3. List of miscellaneous map sheets issued 1930-1931 and in hand March 31, 1931 19

MAPS

Index map and portions of Beaupré and Kississing districts ..... Inside back cover.

REPORT OF THE

TOPOGRAPHICAL SURVEY, DEPARTMENT OF THE INTERIOR

FOR THE FISCAL YEAR ENDED MARCH 31, 1931

GENERAL STATEMENT

In a country the size of Canada, with so many of its resources still in the process of development, with its diversity of topography, and its expanses of territory as yet unexplored, maps occupy an important place. They form a background upon which problems relating to that development may be studied and worked out to the best solution.

Such problems may range in scope from large to small, may be the concern of the federal administration or the administrations, in turn, of province, county, city, town, or municipality. However large or however small they may be, maps will be found to be of assistance, and in many cases a necessity. The type of map most generally suitable is the topographic map.

The work of the Topographical Survey concerns itself with the production of such maps, and with certain associated activities. For many years after it was organized—just two years after Confederation—its principal task related to the survey and subdivision of the Canadian Northwest, a work which has provided a basis upon which the later topographic mapping of the country can be carried out.

CANADA'S POWER POSSIBILITIES

The extension of mapping operations into the regions back of present settlement is constantly bringing to light resources that will some day contribute their share toward Canada's future prosperity. Included in such resources is the possible utilization of power sites along the many waterways of the north. This view is of a fall, as yet unnamed, on the Foster river in northern Saskatchewan.

The topographic mapping of a country of the size of Canada is a tremendous task and, like many other large undertakings, can best be proceeded with when undertaken in an orderly and systematic manner. Haphazard and sporadic attempts are likely to result in a want of uniformity, divergence in the matter of scale and a consequent lack of economy in execution. In the national mapping program carried on by the Topographical Survey, the various map sheets issued from time to time are in accordance with a definite plan which embraces the entire country.

For the purpose of this program the Dominion is divided off into quadrangles whose bounding lines are meridians of longitude spaced eight degrees apart and parallels of latitude four degrees apart. Each of these quadrangles represents a sixteen-mile map sheet which is a major unit in the scheme. These are further subdivided in turn into the eight-mile, four-mile, two-mile and one-mile sheets. The one-mile sheet, for instance, would be bounded by meridians of longitude spaced a half-degree apart and parallels of latitude a quarter-degree apart.

A large portion of Canada's terrain lying back from present settlement belongs to the Pre-Cambrian formation, a formation which exhibits little change in major relief and is characterized by water features which spread themselves out in endless profusion. Add to this a dense forest cover and there results a class of topography that renders the work of the topographer who endeavours to map the country by the regular ground methods a most difficult task. This class of country, however, for maps on certain scales is well adapted to the use of aerial photography; without its use, indeed, the production of such maps would be an almost hopeless undertaking.

In carrying on the aerial photographic operations, co-operation is maintained with the Royal Canadian Air Force of the Department of National Defence, the actual taking of the aerial photographs being handled by that organization. This co-operation has been the means of effectively advancing Canada's national mapping program.

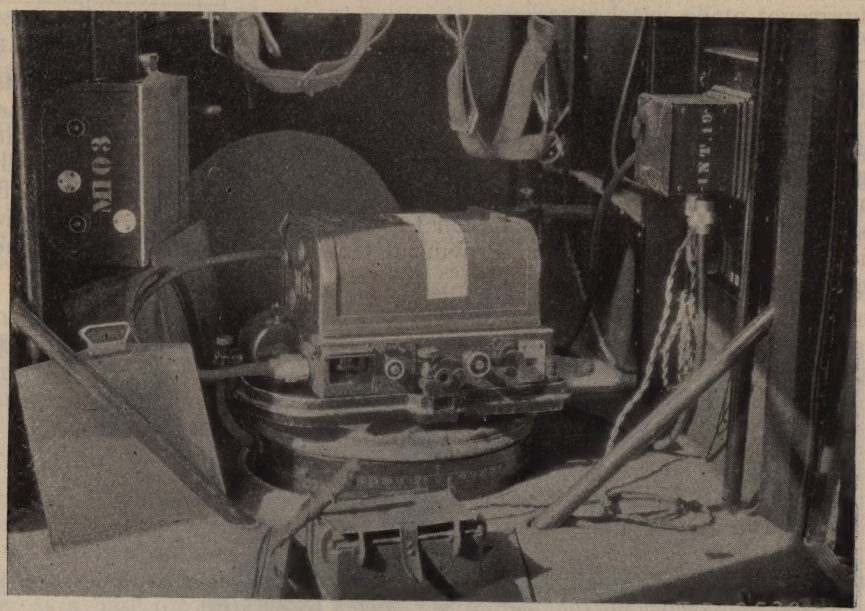
Aerial photographic mapping methods are also of advantage in other parts of the country and have entered more and more into the work of the organization. Ground surveys are also required, however, these being largely in the nature of control surveys and the field interpretation of the features appearing upon the photographs. Also in certain classes of mapping, ground methods are co-ordinated with the aerial work as considerations of expediency and economy advise.

During the year field operations were carried on in every province of the Dominion, excepting Prince Edward Island, and in the Yukon and Northwest Territories. In the prosecution of these surveys, separate parties were employed for the full season and, in addition, surveys engineers acted throughout the season as representatives of the Topographical Survey and technical advisers with the detachments of the Royal Canadian Air Force engaged in taking photographs for aerial mapping operations. Several small survey operations, the necessity for which developed during the season, were carried out by other members of the staff. In gathering the topographic data and in the work generally, co-operation was maintained with all other surveying and mapping organizations.

The area covered during the year by newly issued map sheets, exclusive of a number of general map sheets, aerial navigation maps, etc., is 59,300 square miles. Of this amount, 40,500 square miles are covered by map sheets of the National Topographic series—standard, provisional, and exploratory editions—and the remainder by sheets of the Sectional Map series and in a few cases by other map sheets designed to meet special needs.

RESUME OF OPERATIONS FOR THE YEAR

Aerial Surveys.—Under the heading of aerial surveys, the following work was carried on: the issuing of the necessary technical instructions to the Royal Canadian Air Force for 53 aerial photographic operations; assisting the photographic detachments on such operations in outlying districts by providing surveys engineers to act in an advisory capacity to ensure that the operations are carried out in accordance with the instructions issued; compiling topographic maps from both vertical and oblique aerial photographs; indexing, recording and filing aerial photographs, and selecting and supplying copies of same as requested.



AERIAL CAMERA MOUNTED FOR VERTICAL PHOTOGRAPHY

Interior of photographic aircraft with camera projecting through a port in the floor, arranged for taking vertical aerial views. The camera is fitted with a magazine, spare magazines being at hand alongside, each containing film sufficient for 100 exposures. The required forward overlap of 60 per cent between successive photographs is provided for by the intervalometer shown on the right-hand wall. This is an electrically driven timing instrument for automatically operating the shutter at any predetermined interval. The graduated arc even with the floor furnishes a convenient means of reference for keeping the sides of the camera plate parallel to the track of the aircraft while in flight.

The aerial photographic surveys made during the year have been applied by or through the Department to many purposes such as topographical mapping; the mapping of timber types, and mapping in connection with forest protection; the investigation and development of the forested and mineralized areas of northern Canada; the location of transmission lines; reconnaissance for railway location; irrigation surveys; town planning; road construction; investigation of water-power development and water storage; development of tourist traffic; and administrative, educational and illustrative purposes.

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The areas covered by aerial photographic operations during the year, exclusive of those connected with operations for experimental or illustrative purposes, comprised 54,100 square miles and were distributed as follows:—

Province	Vertical Photography	Oblique Photography
New Brunswick	1,500	0
Quebec	6,700	0
Ontario	2,200	3,000
Manitoba	1,600	0
Saskatchewan	1,100	25,400
Alberta	1,700	200
British Columbia	6,500	0
Northwest Territories	0	4,200
	21,300	32,800

For the carrying on of this work there were eleven photographic flights of two aeroplanes each operating throughout Canada, and over 103,809 aerial photographs resulted, one index copy of each of these being placed in the national index maintained by the Topographical Survey. In addition to this, 49,570 prints were received for various purposes such as for surveyors' uses in the field, constructing mosaic maps, transmission to other federal services, or for distribution on a repayment basis to Provincial Government offices, city engineers, municipalities, etc.

AERIAL CAMERA MOUNTED FOR OBLIQUE PHOTOGRAPHY

View taken at Sled lake, Saskatchewan, showing camera fitted with camera magazine mounted in the front cockpit of a flying boat, ready for taking oblique aerial photographs. An encircling band, attached to the ends of a forked standard which is allowed to travel on a semi-circular track at the front of the cockpit, provides a means whereby the camera may be swung through an arc of about 200 degrees and may be pointed downward at the depression angle desired. The camera sight, shown attached at the top is used in directing the camera when in operation. For each regular oblique aerial mapping view, the sight is laid on the apparent horizon so that it will be included in the resulting photograph, its position therein being a determining factor in the subsequent plotting operations.

From oblique photographs five 4-mile sheets of the National Topographic series have been issued, the information for a portion of one of these sheets, however, having been obtained from ground methods. From vertical photographs one 3-mile sheet of the Sectional Map series and four 2-mile sheets of the National Topographic series have been issued.

Mosaics of some thirteen different localities were also constructed from vertical aerial photographs.

Topographical and Photo-topographical Surveys.—Ground surveys for the obtaining of topographical detail for mapping purposes extended into six of the provinces. The range of topography covered together with the requirements of the scale of production necessitated the use of various methods of survey. These included the use of the plane-table, in some cases supplemented by vertical aerial photographs as an aid in recording detail; the special method of sectional sheet revision applicable to the prairie areas; and the photo-topographical methods for the rough topography of the mountainous regions of the West, supplemented in places by the range-finder and plane-table.

A total of 17,073 square miles of new topographical mapping was completed from ground methods of survey, and a second revision was made of 1,428 square miles. By provinces the new topographical mapping was distributed as follows: Quebec, 1,812 square miles; Ontario, 3,351 square miles; Saskatchewan, 6,638 square miles; Alberta, 4,572 square miles; and British Columbia, 700 square miles. In addition, a small survey, not included in the above, was performed in New Brunswick.

Of the total of new topographical mapping 5,863 square miles are for publication at a scale of 2 miles to the inch; 8,490 square miles at a scale of 3 miles to the inch; and 2,720 at a scale of 4 miles to the inch. Of the 1,428 square miles of second revision referred to above, 208 square miles are for publication at a scale of 1 mile to the inch, and the remainder or 1,220 square miles at a scale of 2 miles to the inch.

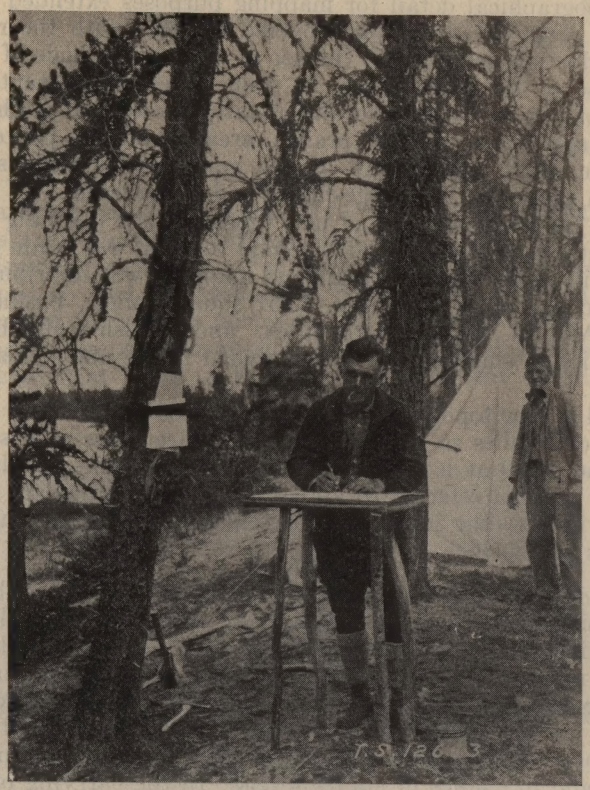
Control and Exploration Surveys.—Control surveys as a basis for topographical mapping were carried on in all the provinces with the exception of Alberta and Prince Edward Island. The control established during the year comprised 898 miles of chained traverse, 1,525 miles of stadia traverse, the placing of 387 permanent monuments to perpetuate points of known position to serve as a base for future surveys, the establishment of geographic positions by astronomical observations at 22 different points, and the running of 818 miles of spirit levels and 522 miles of stadia levels. In the carrying on of this work, as in the past, every effort has been made to co-operate with the Survey Departments of the Provincial Governments, with reciprocal benefits to all concerned.

Of particular mention in this connection is the work performed by the Ontario Department of Surveys wherein 419 miles of chain traverse and 12 miles of stadia traverse were run and 132 permanent monuments placed. This work will be of value in connection with the mapping operations of the Survey.

Of the 22 astronomical observations referred to above, 14 were of stations located in the province of Ontario, 5 in Manitoba, and 3 in Saskatchewan. The observations in Ontario were made with an astrolabe instrument.

Legal Surveys.—To provide for the requirements of squatters on unsurveyed land, subdivision surveys were made in parts of nineteen townships lying in general in the Peace River district in Alberta, and in parts of sixteen townships in the Peace River block of British Columbia. Miscellaneous surveys and investigations were also made in twelve other townships in Alberta, and in twenty-two other townships in Saskatchewan. In addition, six other legal surveys, mostly for the location of historic sites in connection with their marking by the Department of the Interior, were made in other provinces.

Interprovincial Boundary Surveys.—Following upon the preliminary work performed during the previous season, the delimitation was completed of that portion of the Manitoba-Ontario boundary extending from the terminal point of the existing meridian boundary northeasterly to the most eastern point of Island lake. The true line consisting of some 87 miles through virgin territory was opened out, chained and monumented; and in addition further preliminary work was performed in connection with the future production of the boundary northeasterly.



FIELD PLOTTING ON CONTROL SURVEYS

This view is taken alongside of one of the newly discovered, and as yet unnamed, tributaries of the Clearwater river in northern Saskatchewan approximately in latitude 56° 57′ and longitude 108° 00′. A stadia survey is being carried along a system of waterways in this locality for the purpose of providing control for mapping by the use of oblique aerial photographs. The field draftsman, upon his improvised drafting table, is plotting the courses of the traverse. The note sheets hanging on the tree alongside contain the list of latitudes and departures for the various courses, together with other mathematical calculations relating thereto. In conjunction with the field plotting, these furnish a check upon the accuracy of the work when closed circuits are effected.

The survey work was carried out by a commission consisting of representatives, respectively, of the two provinces and of the Dominion, the latter being the Surveyor General of Dominion Lands. The work was performed under the technical direction of the Topographical Survey.

Land Classification Surveys.—Reconnaissance examination of unsubdivided lands as a basis for the selection of those areas suitable for agriculture from other lands which would be best adapted either for grazing or forestry purposes, was undertaken over certain lands in Alberta and British Columbia. These lands lay for the most part in the Peace River district and the Peace River Block and comprised 1,037 square miles or 663,680 acres in all. Of this amount 762 square miles were in Alberta and 275 square miles in British Columbia. As a result of these investigations 145 quarter-sections in Alberta were later covered by subdivision surveys and 494 quarter-sections in British Columbia.

Magnetic Declination Surveys.—The work of measuring the true direction, or declination, of the magnetic needle which was begun by the Survey a half-century ago, was continued. This work entails very little expense as it is carried on in conjunction with the regular activities of the Survey, and in this connection, close co-operation is maintained with the Dominion Observatory and the North West Territories and Yukon Branch of the Department of the Interior, the Meteorological Service of Canada, the Ontario Department of Surveys, various other Provincial Governments and individual surveyors.

SURVEY EQUIPMENT AWAITING AERIAL TRANSPORTATION

Aircraft of the Royal Canadian Air Force drawn up at the bank of Slave river a few miles south of Fitzgerald, Alberta. These aircraft are used, among other activities, on the aerial mapping operations of the Topographical Survey, carried on throughout the northern portions of the Prairie Provinces and in the Northwest Territories. On such operations a surveys engineer, acting as a field representative of a Topographical Survey usually accompanies the photographic crew of the Royal Canadian Air Force as technical adviser in making the actual flights. He also may engage, when required, in taking astronomical observations for latitude and longitude at certain key points over the territory to be mapped, to which he would be transported by the aircraft. In the view the surveying instruments belonging to one of these surveys engineers, together with other equipment, are piled up on the shore awaiting transfer to one of the aircraft, preliminary to making a flight.

During the year some 2,000 precise measurements of the true direction of the compass needle in Canada were made, bringing the total number of such measurements up to 28,000. Of the number obtained, over 200 measurements were made by Ontario Land Surveyors in the employ of the Ontario Department of Surveys.

To make the precise declination results readily available to the public in the most convenient form, the custom prevailing in other countries of publishing declination charts at five-year intervals has been followed by this Survey. A

new declination chart, "Lines of Equal Magnetic Declination and Annual Change in Canada for 1932," was put in hand. It is being compiled from all data available from all sources to form the latest chart in the series published by this Survey at five-year periods: 1907, 1912, 1917, 1922, 1927, and 1932.

Each new map sheet of the National Topographic series, the Sectional Map series, etc., as in the past, was published with a small declination chart in the corner showing all available compass information from all sources to date of publication for the district covered by the new map sheet, in order to supply up-to-date practical compass information to those using the maps. Twenty of these small declination charts were compiled during the year.

In connection with the field work also, measurements of the compass needle direction were made at 80 repeat stations at important points in close co-operation with the provinces in order to find out how much the compass needle had changed direction at those points during the past few years. Also 66 new repeat stations were established where such measurements can be made in future, and were marked with permanent bronze marks for the convenience of provincial surveyors in standardizing their compasses.

As in the past, all magnetic instruments used were standardized at the beginning and at the end of the season at the Magnetic Observatory, Agincourt, Ontario, through the courtesy of the Director of the Meteorological Service of Canada. Thus all results are reduced to International Magnetic Standard.

Correspondence was carried on with many scientific and government authorities, commercial firms and the public; and the regular office work connected with computing, reducing and preparing returns for publication, obtaining index constants for compass theodolites, preparing instructions for field parties, investigating new instruments, etc., was carried out as in the past. Researches were made in decimal inequality and secular change, etc., with the object of still further improving the work.

Physical Testing Laboratory.—A list of the scientific instruments tested during the year, not including tests made for laboratory standard maintenance or research purposes, comprises some forty-seven types of instruments. A list of these would include such instruments as various types of petroleometers, altimeters, binoculars, surveying transits, altitude recorders, revolution indicators, aneroid barometers, watches, oil pressure gauges, compasses, cement sieves, etc.

Three new standard one-metre rules were purchased. Two of these are 43 per cent nickel steel and the third is made of the new alloy fixinvar. A fixinvar tape, of which the thermal dilatation was found to be negligibly small, was also purchased for experimental purposes. It is desired to acquire data as to the suitability of this new material for making tapes to be used in accurate chaining.

Registration, Records and Distribution.—Survey returns received for examination from surveyors in the field and entered in the various registers comprised 398 books of field notes, 359 plans, 1,345 miscellaneous returns, and 18,567 field copies of aerial photographs. During the year 250 new books and 700 new plans were placed on record, the total number on official record now being 21,063 books and 37,775 plans.

In the same period there were distributed 48,218 copies of the various maps, 4,282 publications, and 31,690 copies of official plans, making a grand total of 84,190. In the distribution of these 12,087 requests were dealt with.

Map Publication.—A list of the map sheets published by the Survey during the fiscal year and of those in hand on March 31, 1931, is given in Appendices II and III. With regard to the construction of relief maps of important urban centres or of areas of special interest, two original models were made.

GEOGRAPHIC BOARD OF CANADA

The Geographic Board of Canada was created by Order in Council on December 18, 1897. This Order in Council directs that all questions concerning geographic names in the Dominion which arise in the various departments of the public service shall be referred to the Board and all departments shall accept and use in their publications the names and orthography adopted by the Board. By Order in Council of December 14, 1899, each of the provinces was invited to nominate one of its officials as a representative member and since that time the provinces have had representation on the Board. The present membership consists of a chairman, an executive committee of three, and sixteen members and provincial representatives.

The chairman was J. D. Craig, B.A., B.Sc., Director General of Surveys, Department of the Interior, and International Boundary Commissioner. The executive committee consisted of W. H. Boyd, Chief Topographical Engineer, Geological Survey, Department of Mines; F. H. Peters, M.E.I.C., M.Am.Soc.C.E., Surveyor General, Department of the Interior; and J. E. Chalifour, Chief Geographer, Department of the Interior. The Board regrets the death of the secretary, Robert Douglas, M.A., on November 3, 1930. The new secretary is J. H. Corry, who is also a member of the staff of the Department of the Interior.

BOARD OF EXAMINERS FOR DOMINION LAND SURVEYORS

The Board of Examiners for Dominion Land Surveyors held two meetings during the year.

The first was a special meeting lasting from Monday, April 28, 1930, to Monday, June 2, 1930 (inclusive), during which examinations were held at Ottawa, Montreal, and Kingston.

The second was the regular annual meeting called for by Section 9 of the Dominion Lands Surveys Act. It began on Monday, February 9, 1931, and lasted to Thursday, March 12, 1931 (inclusive). During this meeting examinations were held at Ottawa, Toronto, Kingston, Winnipeg, Saskatoon, and Calgary.

The total number of candidates who presented themselves at the examination was eighty-five. Of these, sixty-four tried the Preliminary Examination, six the Final Examination, and fifteen the Examination for Levellers.

Twenty-three candidates were successful at the Preliminary Examination as follows:—

Bake, W. W.	Gauthier, L.	Montplaisir, L.
Bastien, G.	Huggins, M. W.	Moses, G. B.
Beaulieu, P.	Jaworski, G.	Moule, H.G.
Blondin, G.	Johnson, R.	Nidd, M.E.
Connelly, A.B.	Larose, C.	Paine, W. S.
Dufresne, P.	Legault, G.	Thomas, A.
Ferguson, A.	Major, G.	Wright, A. L.
Finnegan, N. O.	Monette, E.	

One candidate was successful at the Final Examination as follows:—

H. L. Land, Ottawa

Six candidates were successful at the Leveller's Examination as follows:—

Ahearn, T. C.	Capstick, E. H.	Patterson, R. E.
Brown, S. C.	Irish, C. H.	Ruddy, T. A.

The time of the board during the meetings was largely taken up with the reading and valuation of the candidates' answer papers. Complete sets of question papers to be used at the succeeding examinations were also prepared.

Nine certificates of Preliminary Examination were issued to successful candidates who had complied with the requirements of the law.

Six certificates as Levellers were issued to candidates who had successfully passed the examination.

Three standard measures of length were issued during the year.

APPENDIX I

SCHEDULE OF SURVEYORS EMPLOYED AND WORK EXECUTED BY THEM 1930-1931

BENNETT, G. A.—Laying down horizontal and vertical control in the Maritime Provinces for plane-table mapping of Amherst one-mile sheet, No. 21-H/16, and the completion of control necessary for mapping from vertical aerial photographs the following two-mile sheets: Bridgewater, No. 21-A/S.E.; St. Martin, No. 21-H/S.W.; and Chipman, No. 21-I/S.W., all of the National Topographic series; mapping by plane-table to a scale of 100 feet to an inch, contour interval 5 feet, of Fort Beausejour National park in New Brunswick; taking 159 observations for magnetic declination in Nova Scotia and New Brunswick, including 38 repeat observations and establishing 32 new meridian stations; supervising the survey by R. R. Ross, assistant, acting under his commission as a provincial land surveyor for Nova Scotia of two historic sites for the Department of the Interior.

BRIDGLAND, M. P.—Subdivision surveys in township 78, ranges 8, 9 and 10; township 79, range 10; townships 77, 78 and 79, range 11; township 71, range 13; and townships 78 and 79, range 20; all west of the Sixth meridian; the taking of 74 observations for magnetic declination in Alberta and British Columbia, including the establishment of one new meridian station.

CALDER, J. A.—Subdivision surveys in township 86, range 4; township 87, ranges 5, 6 and 9; townships 82, 83 and 84, range 12; and townships 82 and 83, range 13; all west of the Sixth meridian; the taking of 55 observations for magnetic declination in Alberta, including the establishment of one new meridian station.

CARROLL, JOHN.—Acting as representative of the Topographical Survey and technical adviser on aerial photographic surveys over all or portions of the following map sheets of the National Topographic Series: Fort Coulonge, No. 31-F/N.E.; Lachute, No. 31-G/N.E.; Mont Laurier, No. 31-J/N.W.; Maniwaki, No. 31-J/S.W.; Tomasine, No. 31-K/N.E.;

MONUMENTING CONTROL SURVEYS IN NOVA SCOTIA

One of a series of photographs, taken primarily for purposes of record, of monuments placed to mark the stations of a chained traverse survey carried on in central Nova Scotia to provide both horizontal and vertical control for topographical mapping. The monument consists of a bronze rock post cemented into a large granite boulder embedded in the ground and so situated that it will not likely be moved by road-work operations. The picket with sheet and post numbers is a temporary arrangement only, devised so that these numbers will be conveniently recorded upon the photograph.

Gracefield, No. 31-K/S.E.; La Tuque, No. 31-P/S.E.; and Doucet, No. 32-C/S.E.; aerial reconnaissance and investigation of lakes Mistassini and Chibougamou in Quebec for purposes of water storage information; certain experimental work in connection with forestry purposes; supervising the work of S. Jowitt in the field indexing of the aerial photographs obtained; taking one observation for magnetic declination in Quebec

CHARTRAND, D.E.—Field interpretation from vertical aerial photographs of topography included in the Prince Albert four-mile sheet, No. 73-H, of the National Topographic series; a rapid field revision of part of the Rainy Hills sheet, No. 116, and of the Sounding Creek sheet, No. 166, and Kindersley sheet, No. 167, of the Sectional Map series.

CHRISTIE, WM—Observing for latitude and longitude by the astrolabe method of astronomy at fourteen localities in northwestern Ontario, in connection with control for mapping from aerial photographs; taking 42 observations for magnetic declination in northwestern Ontario.

DAVIDSON, R. D.—Acting as representative of the Topographical Survey and technical adviser on oblique aerial photographic operations over all or portions of the following map sheets of the National Topographic series: Nipigon, No. 52-H, in the province of Ontario; Tazin, No. 74-N, and Fond du Lac, No. 74-O, in the province of Saskatchewan; and Salt River, No. 85-A, in the Northwest Territories; taking 8 observations for magnetic declination in Saskatchewan and Alberta.

DICKSON, H. G.—The delimitation of about 40 miles of road between Mayo and Dawson in Yukon Territory (performed under contract, Mr. Dickson not being a member of the staff).

FLETCHER, W. A.—Laying down main mapping control for mapping by the use of vertical aerial photographs the Mont Laurier sheet, No. 31-J/N.W., and the Maniwaki sheet, No. 31-J/S.W., of the National Topographic series, in the province of Quebec; taking 82 observations for magnetic declination in the province of Quebec, including 2 repeat observations and the establishment of 6 new meridian stations.

FRY, E. S.—Acting as representative of the Topographical Survey and technical adviser on oblique aerial photographic surveys over portions of three 4-mile map sheets in the vicinity of Ile-a-la-Crosse, Saskatchewan, and of two 4-mile map sheets in the vicinity of Hay river, Northwest Territories.

GORMAN, A. O.—In Saskatchewan: survey of Industrial School site at Regina; survey of addition to townsite of Paradise Hill in township 52-24-3; miscellaneous surveys and investigations in nineteen other townships; the taking of 13 observations for magnetic declination, including three repeat observations and the establishment of two new meridian stations. In Alberta: miscellaneous surveys and investigations in twelve townships; the taking of 7 observations for magnetic declination, including one repeat observation and the establishment of one new meridian station.

HARRIS, L. E.—The photo-topographical mapping of 80 square miles of the mountainous regions of British Columbia on the Glacier Park two-mile map sheet, No. 82-N/S.W., and of 320 square miles on the Bush River two-mile map sheet, No. 82-N/N.W., of the National Topographic series; the taking of 10 observations for magnetic declination in British Columbia and 3 repeat observations in Alberta.

LAMBART, H. F. J.—Astronomical observations to determine the intersection of the south boundary of Thelon Game Sanctuary with the east shore of Artillery lake, and the delimitation of this boundary easterly therefrom; settlement surveys at Providence and investigations at Fort Smith, all in the Northwest Territories; the taking of 4 observations for magnetic declination in the Northwest Territories, including repeat observations at Fort Smith and Providence, and the establishment of a new meridian station at the latter place.

LEBLANC, P. M. H.—Laying down main mapping control for mapping by the use of vertical aerial photographs the Tomasine sheet, No. 31-K/N.E., of the National Topographic series, in the province of Quebec; taking 298 observations for magnetic declination in Quebec and establishing 6 new meridian stations.

LONERGAN, G. J.—Land examination to determine advisability of subdividing previously unsubdivided lands as follows: approximately 762 square miles lying in general in the Peace River area of Alberta and 275 square miles in the Peace River Block of British Columbia.

MACDONALD, C. S.—While temporarily attached to the Department of National Defence, the superintendence, inspection and replenishment of Royal Canadian Air Force refuelling bases, the direction of aerially photographing certain unmapped air routes in the Northwest Territories and the establishment of ground control relating thereto, the

determination of the approximate latitude and longitude of certain points in the Northwest Territories and other work of an investigational nature including the taking of 7 observations for magnetic declination at Hunter bay on Great Bear lake, Beverly lake, Baker lake, Coppermine, Chesterfield and Tavane, all in the Northwest Territories.

McCUSKER, K. F.—Subdivision of lands for settlement in parts of townships 85 and 86, range 16; townships 85, 86 and 87, range 17; townships 86, 87 and 88, range 18; townships 83, 86, 87 and 88, range 19; and township 87, range 20, all west of the Sixth meridian; and the taking of 50 observations for magnetic declination in British Columbia.

PIERCE, J. W.—Completion of the survey of the Ontario-Manitoba boundary line from the twelfth base line of the Dominion Lands System to the most eastern point of Island lake, and the commencement of the survey of the portion northeasterly therefrom; the taking of 91 observations for magnetic declination on the above line including one repeat observation, and 7 additional observations in Manitoba.

PERRY, A. M.—Stadia surveys in northern Saskatchewan northerly from Ile-a-la-Crosse lake and Churchill river, to and around Cree lake, and astronomical observations for latitude and longitude at three different points, for mapping control for oblique aerial photographs; the taking of 113 observations for magnetic declination in Saskatchewan and the establishment of 3 new meridian stations.

OBLIQUE AERIAL MAPPING VIEW "MARKED UP" FOR PLOTTING

The oblique aerial photographic method of mapping is made use of in the production of four-mile map sheets of those areas of low relief, filled with numerous water features, lying within the Pre-Cambrian formation in Canada. It is a cardinal requirement, in the method employed, that the horizon line appear near the upper edge of the photograph and be capable of accurate identification. The water features, the outlines of which constitute the greater portion of the topography to be plotted, should also be capable of ready identification, although photographic excellence is not always possible of attainment.

Photographs sometimes have to be taken when the weather conditions are not conducive of the best results although, for the purposes of mapping, they may reveal the features sufficiently well. As an aid in the subsequent plotting, before the map grid is applied for the production of the map plot, it is the practice to "mark up" the outlines of the water features in the foreground portion of the view, that is, the portion to be plotted, with white ink.

The view above, reduced from the original contact print, is a particularly good one and is of Maynard falls, looking downstream on the English river in northern Ontario.

PURSER, R. C.—Under his commission as Ontario Land Surveyor, the survey of a historic site at Maitland, Ontario.

RINFRET, C.—Original mapping by plane-table with the aid of vertical aerial photographs of 180 square miles, and the field revision of 1,220 square miles, of the Quebec two-mile sheet, No. 21-L/N.W., of the National Topographic series; the taking of 104 observations for magnetic declination in Quebec, including 30 repeat observations and the establishment of 8 new meridian stations.

RUSSELL, J.—Stadia traverse control for plotting from oblique aerial photographs a four-mile sheet of the National Topographic series in the region of Reindeer lake, Manitoba; astronomical observations for latitude and longitude at five different places; the taking of 54 observations for magnetic declination in Manitoba including one repeat observation and the establishment of 4 new meridian stations.

SEGRÉ, B. H.—The field interpretation of the topography shown on vertical aerial photographs and the checking of plotted information therefrom on the following two-mile sheets of the National Topographic series: Buckingham, No. 31-G/N.W.; Sundridge, No. 31-E/N.W.; and North Bay, No. 31-L/S.W.; and of an area in the vicinity of Sudbury.

TAGGART, C. H.—Laying down mapping control to supplement existing control and topographic mapping with the aid of vertical aerial photographs of 300 square miles to complete the Shuswap Lake sheet, No. 82-L/N.W., of the National Topographic series; laying down main mapping control to supplement existing control for mapping from vertical aerial photographs for sheets Nos. 92-G/2, 92-G/3, westerly portion of 92-G/1 and southerly portions of 92-G/6 and 92-G/7, one-mile sheets of the National Topographic series; acting as liaison officer in connection with the mapping program being carried out co-operatively between the Geographic Section, Department of National Defence, and the Topographical Survey, at the south end of Vancouver island for sheets Nos. 92-B/5, 92-B/6, 92-B/11, and 92-B/12 of the National Topographic series, and also as technical officer on vertical aerial photographic surveys carried out by the Royal Canadian Air Force in the province of British Columbia, covering the following map sheet areas: 62-L/1, 62-L/2, 62-L/6, 62-L/7, 62-L/8 on the north end of Vancouver island, 92-G/1, 92-G/2, 92-G/3, 92-G/6, 92-G/7, 92-G/8 in the vicinity of Vancouver and Fraser River delta, 93-A/12 in the vicinity of Quesnel lakes, and the north half of 82-L/N.W. in the vicinity of north end of Okanagan lake; the taking of 86 observations for magnetic declination in British Columbia, including one repeat observation, and the establishment of 5 new meridian stations.

Surveyors and engineers from other branches of the Department who performed work during the season in co-operation with and under technical instructions from the Topographical Survey:—

BLANCHET, G. H., D.L.S.—Under direction of the Supervisory Mining Engineer—the taking of 7 observations for magnetic declination at Coppermine, Rae river, cape Kendall and Port Epworth.

CUMMING, A. L., D.L.S.—Under direction of the Supervisory Mining Engineer—the taking of 5 observations for magnetic declination at Bolands Harbour, Hunter bay and Sloan river.

MEIKLE, M., D.L.S.—Under direction of the Supervisory Mining Engineer—the taking of 3 observations for magnetic declination at Fort Smith.

SOPER, J. D.—North West Territories and Yukon Branch—the taking of 168 observations for magnetic declination in the Northwest Territories, and the establishment of one new meridian station at Lake Harbour.

Ontario Land Surveyors during the course of the year co-operated with the Topographical Survey by taking observations for magnetic declination in Ontario as follows: Beatty and Beatty, 32; Phillips and Benner, 27; Speight and van Nostrand, 18; G. P. Angus, 10; R. W. Code, 4; J. T. Coltham, 52; C. R. Kenny, 8; J. A. S. King, 77; R. S. Kirkup, 11; J. Lenning, 6; E. M. MacQuarrie, 24; E. L. Moore, 24; H. W. Sutcliffe, 6.

APPENDIX II

LIST OF MAP SHEETS OF THE NATIONAL TOPOGRAPHIC SERIES AND THE SECTIONAL MAP SERIES ISSUED 1930-31, AND IN HAND MARCH 31, 1931

ISSUED 1930-31

Prov.	No.	Series	Name	Scale	Latitude	Longitude	Remarks
Que.....	31-0/S.E.	N.T....	Kempt Lake.....	2	47° 00′ to 47° 30′	74° 00′ to 75° 30′	*(b)*
	31-C/S.W.	N.T....	Petawaga.....	2	47° 00′ to 47° 30′	75° 00′ to 76° 00′	*(b)*
Ont.....	41-H/S.E.	N.T....	Parry Sound.....	2	45° 00′ to 45° 30′	80° 00′ to 81° 00′	*(b)*
	52-F	N.T....	Dryden.....	4	49° 00′ to 50° 00′	92° 00′ to 94° 00′	*(b)*
	52-K/S.E	N.T....	Hudson.....	2	50° 00′ to 50° 30′	92° 00′ to 93° 00′	*(b)*
Man.....	524	Sect....	Limestone River..	3	55° 59′ to 56° 41′	94° 00′ to 96° 04′	*(f)*Reprint
	62-H	N.T....	Winnipeg.....	4	49° 00′ to 50° 00′	96° 00′ to 98° 00′	*(a)*
	63-I	N.T....	Cross Lake.....	4	54° 00′ to 55° 00′	96° 00′ to 98° 00′	*(b)*
	63-P	N.T....	Sipiwesk.....	4	55° 00′ to 56° 00′	96° 00′ to 98° 00′	*(b)*
	63-B	N.T....	Waterhen.....	4	52° 00′ to 53° 00′	98° 00′ to 100° 00′	*(b)*
Sask....	219	Sect....	Humboldt.....	6	51° 47′ to 52° 30′	103° 59′ to 106° 00′	*(d)*
	19	Sect....	Willowbunch.....	3	49° 00′ to 49° 42′	104° 00′ to 106° 00′	*(e)*
	119	Sect....	Regina.....	3	50° 24′ to 51° 06′	104° 04′ to 106° 00′	*(d)*Reprint
	18	Sect....	Wood Mountain...	3	49° 00′ to 49° 42′	106° 00′ to 108° 02′	*(e)*
	18	Sect....	Wood Mountain...	6	49° 00′ to 49° 42′	106° 00′ to 108° 02′	*(e)*
	417	Sect....	Primrose.....	3	54° 35′ to 55° 17′	107° 58′ to 110° 00′	*(f)*Reprint
	217	Sect....	Tramping Lake...	3	51° 47′ to 52° 30′	107° 59′ to 110° 00′	*(d)*
	217	Sect....	Tramping Lake...	6	51° 47′ to 52° 30′	107° 59′ to 110° 00′	*(d)*
	317	Sect....	Fort Pitt.....	3	53° 11′ to 53° 53′	108° 05′ to 110° 00′	*(f)*Reprint
Alta.....	66	Sect....	Medicine Hat.....	3	49° 42′ to 50° 24′	110° 00′ to 112° 04′	*(d)*Reprint
	74M	N.T....	Fitzgerald.....	4	59° 00′ to 60° 00′	110° 00′ to 112° 00′	Explor.
	465	Sect....	Pelican.....	3	55° 17′ to 55° 59′	112° 00′ to 114° 00′	*(f)*Reprint
	115	Sect....	Blackfoot.....	3	50° 24′ to 51° 06′	112° 04′ to 114° 00′	*(d)*Reprint
	365	Sect....	Victoria.....	6	53° 53′ to 54° 36′	112° 05′ to 114° 00′	*(d)*
	82-J/16....	N.T....	Calgary S.W.....	1	50° 45′ to 51° 00′	114° 00′ to 114° 30′	*(a)*
	364	Sect....	Fort Assiniboine..	3	53° 53′ to 54° 36′	114° 00′ to 116° 06′	*(d)*
	414	Sect....	Saulteaux.....	3	54° 35′ to 55° 17′	114° 00′ to 116° 00′	*(f)*Reprint
	514	Sect....	Atikamik.....	3	55° 59′ to 56° 41′	114° 00′ to 116° 04′	*(f)*Reprint
B.C.....	163	Sect....	Donald.....	3	51° 05′ to 51° 48′	116° 09′ to 118° 00′	*(d)*Reprint
Alta.....	362	Sect....	Simonette.....	3	53° 53′ to 54° 35′	117° 59′ to 120° 00′	*(f)*Reprint
Alta.....	512	Sect....	Montagneuse.....	3	55° 59′ to 56° 41′	118° 00′ to 120° 04′	*(f)*Reprint
B.C.....	61	Sect....	Lytton.....	3	49° 42′ to 50° 24′	120° 00′ to 122° 01′	*(f)*Reprint
	92-I/S.E.	N.T....	Merritt.....	2	50° 00′ to 50° 30′	120° 00′ to 121° 00′	*(a)*
	111	Sect....	Kamloops.....	3	50° 24′ to 51° 06′	120° 03′ to 122° 00′	*(f)*Reprint

IN HAND, MARCH 31, 1931

N.S.....	20-P/N.E.	N.T....	Port Mouton.....	2	43° 30′ to 44° 00′	64° 00′ to 65° 00′	
	21-A/S.E.	N.T....	Bridgewater.....	2	44° 00′ to 44° 30′	64° 00′ to 65° 00′	
	20-P/N.W.	N.T....	Shelburne.....	2	43° 30′ to 44° 00′	65° 00′ to 66° 00′	
	21-A/S.W.	N.T....	Rossignol.....	2	44° 00′ to 44° 30′	65° 00′ to 66° 00′	
	21-B/S.E.	N.T....	St. Mary Bay....	2	44° 00′ to 44° 30′	66° 00′ to 67° 00′	
N.B.....	21-I/S.E.	N.T....	Moncton.....	2	46° 00′ to 46° 30′	64° 00′ to 65° 00′	
	21-H/S.W.	N.T....	Loch Lomond....	2	45° 00′ to 45° 30′	65° 00′ to 66° 00′	
	21-I/S.W.	N.T....	Chipman.....	2	46° 00′ to 46° 30′	65° 00′ to 66° 00′	
	21-I/N.W.	N.T....	Newcastle.....	2	46° 30′ to 47° 00′	65° 00′ to 66° 00′	
Que.....	21-M/S.E.	N.T....	Beaupre.....	2	47° 00′ to 47° 30′	70° 00′ to 71° 00′	
	21-L/N.W.	N.T....	Quebec.....	2	46° 30′ to 47° 00′	71° 00′ to 72° 00′	
	31-I/9	N.T....	Grondines.....	1	46° 30′ to 46° 45′	72° 00′ to 72° 30′	
	31-I/N.E.	N.T....	Grand-Mere.....	2	46° 30′ to 47° 00′	72° 00′ to 73° 00′	
	31-P/S.E.	N.T....	La Tuque.....	2	47° 00′ to 47° 30′	72° 00′ to 73° 00′	

Prov.	No.	Series	Name	Scale	Latitude	Longitude	Remarks
	31-G/N.E.	N.T.	Lachute	2	45° 30′ to 46° 00′	74° 00′ to 75° 00′	
	31-J/N.W.	N.T.	Mont Laurier	2	46° 30′ to 47° 00′	74° 00′ to 75° 00′	
	31-O/N.E.	N.T.	Parent	2	47° 30′ to 48° 00′	74° 00′ to 75° 00′	
	31-G/N.W.	N.T.	Buckingham	2	45° 30′ to 46° 00′	75° 00′ to 76° 00′	
	31-F/N.E.	N.T.	Coulonge	2	45° 30′ to 46° 00′	76° 00′ to 77° 00′	
	31-K/S.E.	N.T.	Gracefield	2	46° 00′ to 46° 30′	76° 00′ to 77° 00′	
	31-K/N.E.	N.T.	Tomasine	2	46° 30′ to 47° 00′	76° 00′ to 77° 00′	
	32-C/SE.	N.T.	Doucet	2	48° 00′ to 48° 30′	76° 00′ to 77° 00′	
	32-F	N.T.	Waswanipi	4	49° 00′ to 50° 00′	76° 00′ to 78° 00′	
	32-C/S.W.	N.T.	Senneterre	2	48° 00′ to 48° 30′	77° 00′ to 78° 00′	
	32-D/N.E.	N.T.	Taschereau	2	48° 30′ to 49° 00′	78° 00′ to 79° 00′	
	32-D/N.W.	N.T.	Abitibi	2	48° 30′ to 49° 00′	79° 00′ to 80° 00′	
Ont.	31-E/N.E.	N.T.	Algonquin	2	45° 30′ to 46° 00′	78° 00′ to 79° 00′	
	31-D/N.W.	N.T.	Orillia	2	44° 30′ to 45° 00′	79° 00′ to 80° 00′	
	31-E/N.W.	N.T.	Sundridge	2	45° 30′ to 46° 00′	79° 00′ to 80° 00′	
	31-L/S.W.	N.T.	North Bay	2	46° 00′ to 46° 30′	79° 00′ to 80° 00′	
	41H/N.E.	N.T.	Byng Inlet	2	45° 30′ to 46° 00′	80° 00′ to 81° 00′	
	52-P	N.T.	Mimimiska	4	51° 00′ to 52° 00′	88° 00′ to 90° 00′	
	52-B	N.T.	Quetico	4	48° 00′ to 49° 00′	90° 00′ to 92° 00′	
	52-G	N.T.	Ignace	4	49° 00′ to 50° 00′	90° 00′ to 92° 00′	
	52-C	N.T.	Rainy Lake	4	48° 00′ to 49° 00′	92° 00′ to 94° 00′	
	52-D	N.T.	Rainy River	4	48° 00′ to 49° 00′	94° 00′ to 96° 00′	
	52-E	N.T.	Kenora	4	49° 00′ to 50° 00′	102° 00′ to 104° 00′	*(c)* Reprint
Man.	63-S.E.	N.T.	Lake Winnipeg	8	52° 00′ to 54° 00′	96° 00′ to 100° 00′	
	63-N	N.T.	Kississing	4	55° 00′ to 56° 00′	100° 00′ to 102° 00′	*(b)* New edition
	64-C	N.T.	Granville Lake	4	56° 00′ to 57° 00′	100° 00′ to 102° 00′	
Sask.	64-D	N.T.	Reindeer Lake South	4	56° 00′ to 57° 00′	102° 00′ to 104° 00′	
	19	Sect.	Willowbunch	6	49° 00′ to 49° 42′	104° 00′ to 106° 00′	*(e)*
	73-H	N.T.	Prince Albert	4	53° 00′ to 54° 00′	104° 00′ to 106° 00′	
	74-A	N.T.	Foster Lakes	4	56° 00′ to 57° 00′	104° 00′ to 106° 00′	
	73-J	N.T.	Green Lake	4	54° 00′ to 55° 00′	106° 00′ to 108° 00′	
	73-O	N.T.	Ile-a-la-Crosse	4	55° 00′ to 56° 00′	106° 00′ to 108° 00′	
	74-B	N.T.	Mudjatik	4	56° 30′ to 57° 00′	106° 00′ to 108° 00′	
	167	Sect.	Kindersley	3	51° 05′ to 51° 48′	108° 05′ to 110° 00′	*(e)*
	73-N	N.T.	Dillon	4	55° 00′ to 56° 00′	116° 00′ to 118° 00′	
Alta.	116	Sect.	Rainy Hills	3	50° 23′ to 51° 06′	110° 00′ to 112° 05′	*(e)*
	166	Sect.	Sounding Creek	3	51° 06′ to 51° 48′	110° 00′ to 112° 07′	*(e)*
	73-L	N.T.	Lac la Biche	4	54° 00′ to 55° 00′	110° 00′ to 112° 00′	
	82-I/13	N.T.	Calgary, S.E.	1	50° 45′ to 51° 00′	113° 30′ to 114° 00′	
	82-O/1	N.T.	Calgary N.W.	1	51° 00′ to 51° 15′	114° 00′ to 114° 30′	
	364	Sect.	Fort Assiniboine	6	53° 53′ to 54° 36′	114° 00′ to 116° 07′	*(e)*
	82-N/N.E.	N.T.	Mistaya	2	51° 30′ to 52° 00′	116° 00′ to 117° 00′	
B.C.	82-N/S.E.	N.T.	Yoho	2	51° 00′ to 51° 30′	116° 00′ to 117° 00′	
	82-N/S.W.	N.T.	Glacier Park	2	51° 00′ to 51° 30′	117° 00′ to 118° 00′	
	82-L/N.E.	N.T.	Revelstoke	2	50° 30′ to 51° 00′	118° 00′ to 119° 00′	
	82-L/N.W.	N.T.	Shuswap Lake	2	50° 30′ to 51° 00′	119° 00′ to 120° 00′	

NOTES:—Work performed on those sheets marked "In Hand" ranges throughout the various stages from the commencement of the compilation in the office to the preparation of the final lithographic plates for printing. Some sheets upon which very little work has so far been done are not included in the above list.

Where a map sheet extends into more than one province, it is listed under one province only.

Under the column of "Remarks" the following are the meanings attached to the symbols used:

(a) National Topographic Series—Standard Edition—Topographical information complete.

(b) National Topographic Series—Provisional Edition—Topographical information complete or nearly so (except for contours), over all or greater portion of sheet.

(c) National Topographic Series—Exploratory Edition—Topographical information from exploration surveys, no contours or contours conjectural only.

(d) Sectional Map Series—New Series Edition—Detailed topographical information in eight colours, including contours.

(e) Sectional Map Series—Intermediate Series Edition—Topographical information in five colours, not so complete. Contours, when shown, usually approximate only.

(f) Sectional Map Series—Old Series Edition—General topography only, in from one to four colours.

APPENDIX III

LIST OF MISCELLANEOUS MAP SHEETS ISSUED 1930-31 AND IN HAND MARCH 31, 1931

NOTE.—A number of miscellaneous map sheets issued as indexes and for various other purposes in connection with the work of the organization are not included.

ISSUED 1930–31

Province	Map	Scale	Remarks
P.E.I.	Malpeque Bay Oyster Leases	1,000 ft.	8 sheets.
Man. & Sask.	Winnipeg to Regina	8	Aerial navigation map.
Alta.-B.C.	Sheet 12-A, Alta.-B.C. Boundary	1:25000	Reprint.
B.C.	Yoho Park	2	1927 Edition Revised.
N.W.T.	Providence to Simpson, Exploratory	4	Reprint.
N.W.T.	Simpson to Wrigley, Exploratory	4	"
"	Wrigley to Norman, Exploratory	4	"
"	Norman to Hume River, Exploratory	4	"
"	Hume River to Thunder River, Exploratory	4	"

IN HAND MARCH 31, 1931

Que.	Ottawa-Gatineau	1	
Ont.	Kingston sheet	2	Ottawa to Kingston map.
Ont.	Sudbury District	2	
Man.	Riding Mountain Park	3	
Man.	Churchill River, Churchill to the Four Rapids	4	Aerial navigation map.
Man.	Churchill River, The Four Rapids to Fidler Lake.	4	Aerial navigation map.
Sask.	Saskatchewan, South	12·5	
Sask. & Alta.	Medicine Hat, N.M. 12	15·78	International Map of the World, 1:1,000,000.
Sask.	Prince Albert Park	3	
Alta.	Banff Park	3	
Alta.	Lethbridge-Calgary	8	Aerial navigation map.
Alta.	Calgary-Edmonton	8	Aerial navigation map.
Alta. and N.W.T.	Wood Buffalo Park	8	
N.W.T.	Great Slave Lake, western sheet	6	Reprint.
Canada	Orographical Map of Canada	125	
Canada	Average Date start and end of Flying Season		For use of aerial pilots.

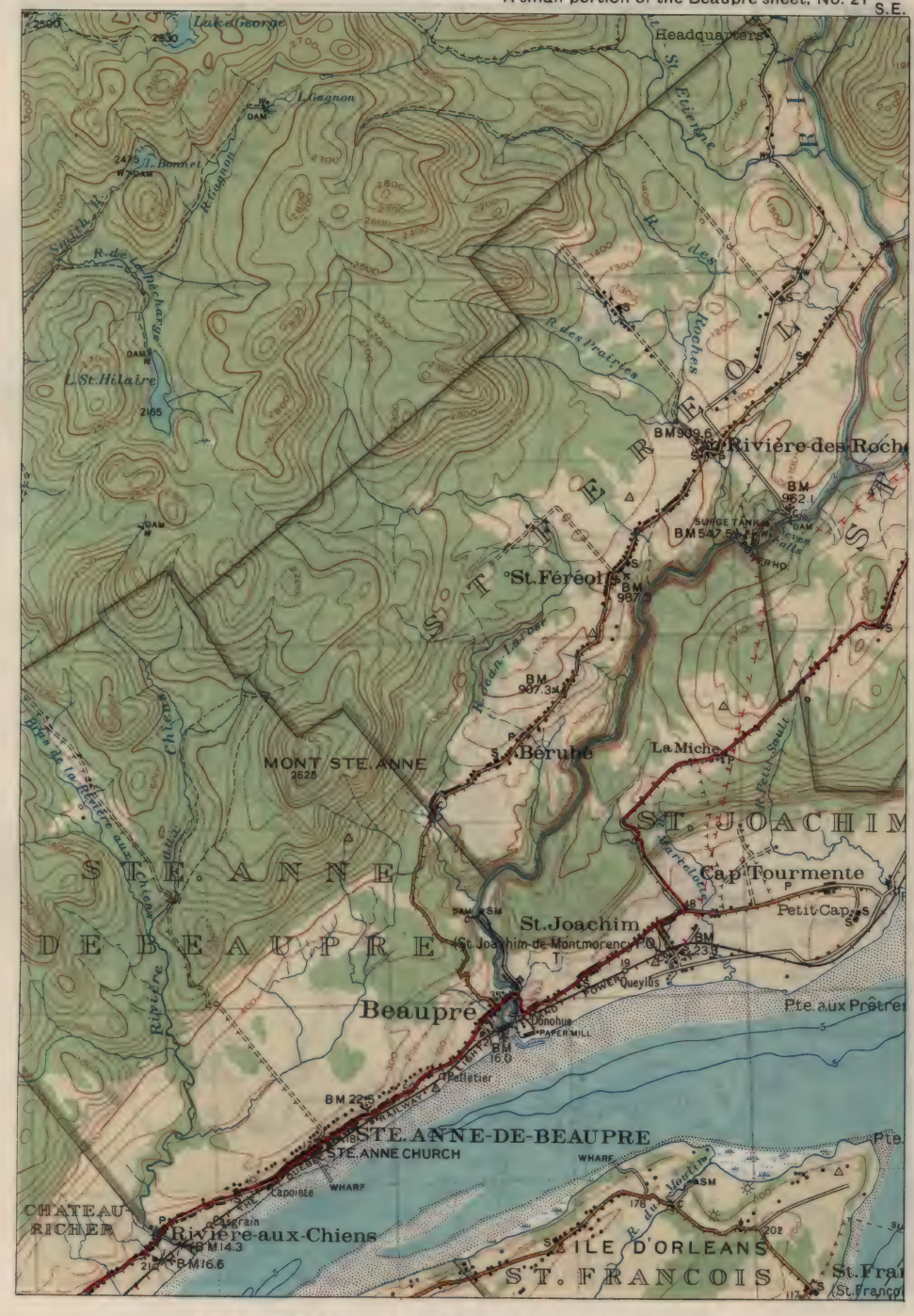
NOTE.—With regard to those sheets marked "In Hand" see first paragraph of "Notes" under Appendix II.

Reqn. 5634

DEPARTMENT OF THE INTERIOR

TOPOGRAPHICAL SURVEY

A small portion of the Beaupre sheet, No. 21 $\frac{M}{S.E.}$



NATIONAL TOPOGRAPHIC SERIES

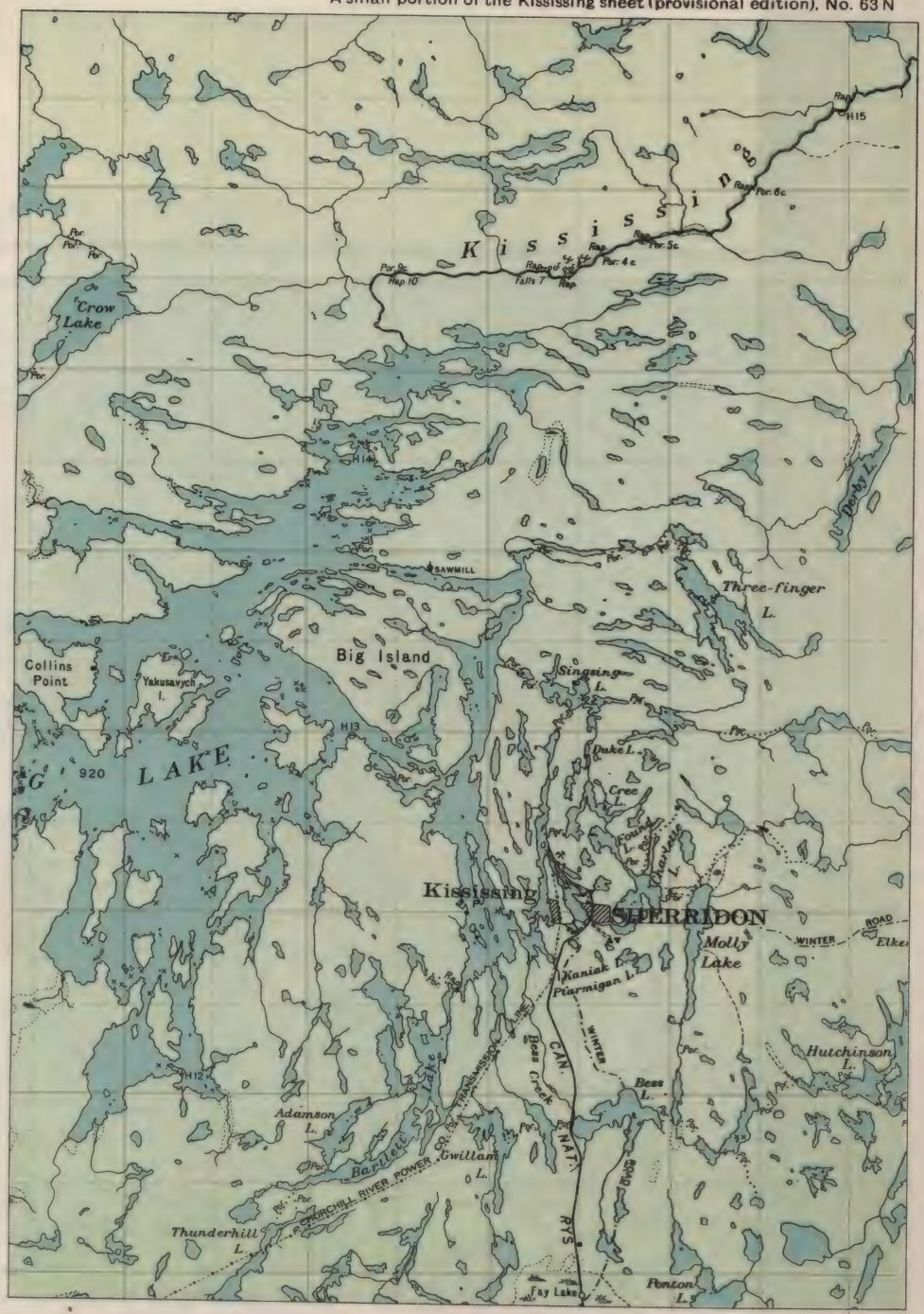
Scale 2 miles to 1 inch

Contour interval 100 feet

DEPARTMENT OF THE INTERIOR

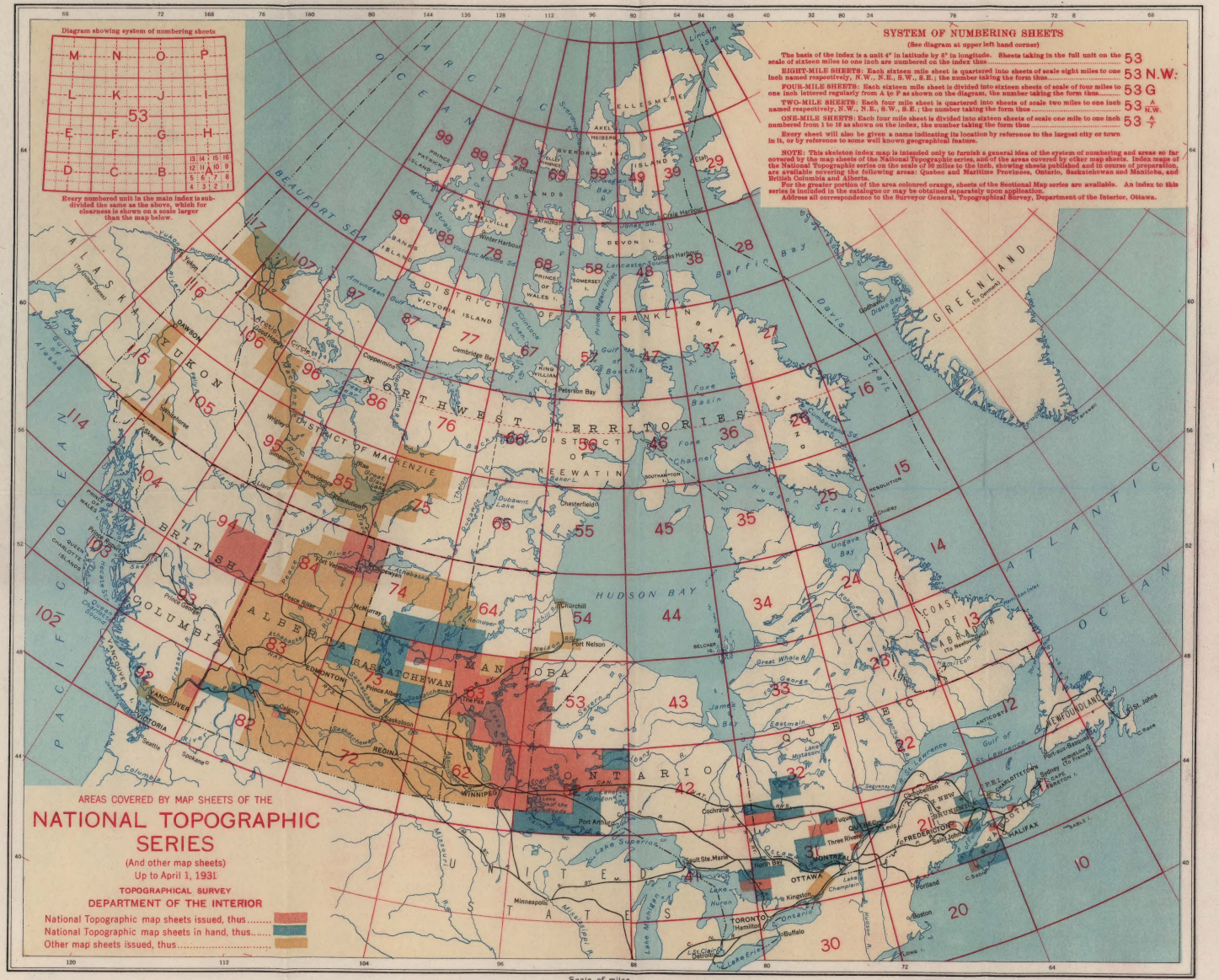
TOPOGRAPHICAL SURVEY

A small portion of the Kissising sheet (provisional edition), No. 63 N



NATIONAL TOPOGRAPHIC SERIES

Scale 4 miles to 1 inch



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